

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
16 June 2005 (16.06.2005)

PCT

(10) International Publication Number
WO 2005/055306 A1

(51) International Patent Classification⁷: **H01L 21/31**

(21) International Application Number:
PCT/KR2004/001092

(22) International Filing Date: 12 May 2004 (12.05.2004)

(25) Filing Language: Korean

(26) Publication Language: English

(30) Priority Data:
10-2003-0086244
1 December 2003 (01.12.2003) KR

(71) Applicant (for all designated States except US): **SO-GANG UNIVERSITY CORPORATION** [KR/KR]; 1 Sinsu-dong, Mapo-gu, Seoul 121-742 (KR).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **RHEE, Hee-Woo** [KR/KR]; 61-502 Banpo-Apt., Banpo bon-dong, Seocho-gu, Seoul 137-040 (KR). **YOON, Do Young**

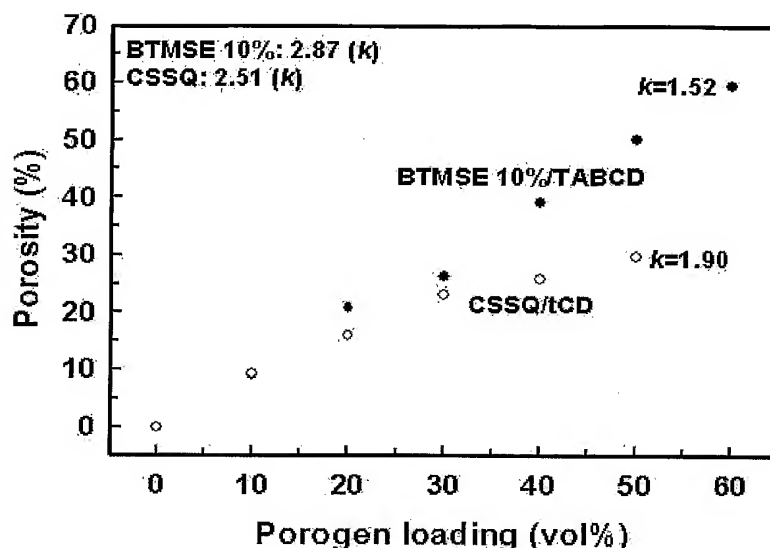
[KR/KR]; 936-208 Faculty house, Bongcheon 7-dong, Gwanak-gu, Seoul 151-057 (KR). **CHAR, Kook Heon** [KR/KR]; A-304, Banpo Hyundai Villa, 104-6 Banpo 4-dong, Seocho-gu, Seoul 137-806 (KR). **LEE, Jin-Kyu** [KR/KR]; 143-902 Gwanak dream town, Bongcheon 5-dong, Gwanak-gu, Seoul 151-770 (KR). **MOON, Bongjin** [KR/KR]; 704-1408 Sinwoo Apt., Muwonmaeul, Haengsin-dong, Deokyang-gu, Goyang-si, Kyunggi-do 412-220 (KR). **MIN, Sung-Kyu** [KR/KR]; 303 Geumtop Villa, 549-1 Gwangjang-dong, Gwangjin-gu, Seoul 143-210 (KR). **PARK, Se Jung** [KR/KR]; 1618-9 Bongcheon 7-dong, Gwanak-gu, Seoul 151-057 (KR). **SHIN, Jae-Jin** [KR/KR]; 722 Yuksa Apt., Gongneung-dong, Nowon-gu, Seoul 139-772 (KR).

(74) Agent: **PAIK, Nam-Hoon**; 14th Fl., KTB Network Bldg., 826-14, Yeoksam-dong, Kangnam-ku, Seoul 135-769 (KR).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,

[Continued on next page]

(54) Title: **ULTRA-LOW DIELECTRICS FOR COPPER INTER CONNECT**



(57) Abstract: The present invention relates to an ultra-low dielectric film for a copper interconnect, in particular, to an porous film prepared in such a manner that coating with an organic solution containing a polyalkyl silsesquioxane precursor or its copolymer as a matrix and acetylcyclodextrin nanoparticles as a template and then performing a sol-gel reaction and heat treatment at higher temperature. The present films may contain the template of up to 60 vol%, due to the use of acetylcyclodextrin, and have homogeneously distributed pores with the size of no more than 5 nm in the matrix. In addition, the present films exhibit a relatively low dielectric constant of about 1.5, and excellent interconnectivity between pores, so that they are considered a promising ultra-low dielectric film for a copper interconnect.

WO 2005/055306 A1



KG, KP, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,

Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.